ONTARIO MINISTRY OF ENVIRONMENT
36936000024481

ANNUAL REPORT 1965

OWEN SOUND

water pollution control plant

LIBRARY COPY
AUG 9 - 1966
ONTARIO WATER
RESOURCES COMMISSION

TD
367
.A56
O94
1965
MOE

DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

TD
367
.A56
O94
1965

Owen Sound : water pollution
control plant.
81788

ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE GENERAL MANAGER

Members of the Owen Sound Local Advisory Committee,
City of Owen Sound.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Water Pollution Control Plant, OWRC Project No. 60-S-68.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water pollution control.

Yours very truly,

D Caverly

D. S. Caverly,
General Manager.

ONTARIO WATER RESOURCES COMMISSION
801 BAY STREET
TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN
J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER
W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1965 Annual Report on the operation of the Owen Sound Water Pollution Control Plant, OWRC Project No. 60-S-68.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

B C Palmer

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

Digitized by the Internet Archive
in 2015

https://archive.org/details/owensoundwaterpo24481

FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

CONTENTS

Foreword 1
Title Page 3
'65 Review 4
Glossary 5
History 6
Project Staff 7
Description of Project 8
Project Costs 10
Plant Flow Chart 13
Design Data 14
Process Data 17

OWEN SOUND

water pollution control plant

operated for

THE CITY OF OWEN SOUND

by the

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

VICE-CHAIRMAN: J. H. H. Root, M.P.P.

COMMISSIONERS

W. D. Conklin, Q.C.
D. A. Moodie
H. E. Brown
L. E. Venchiarutti

GENERAL MANAGER: D. S. Caverly

ASSISTANT GENERAL MANAGERS

L. E. Owers
F. A. Voege
K. H. Sharpe
A. K. Watt

COMMISSION SECRETARY

W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: A. Clark

801 Bay Street Toronto 5

'65 REVIEW

The total flow to the plant in 1965 was 1236.31 million gallons, an average of 3.4 mgd. This is in excess of the plant capacity of 3.0 mgd but the strength of the raw sewage is only 50% of what would be considered normal. The population of the City is slightly less than 18,000 people and it could be assumed that if there was no infiltration, the flow to the plant would be less than 2 mgd.

The cost of operation was $34,109.32 or $27.59 per million gallons. This figure is below average and again indicates a diluted sewage.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY

1960 - 1965

INCEPTION

In 1960, the City of Owen Sound and the Ontario Water Resources Commission initiated plans for the construction of a modern water pollution control plant. The firm of Gore & Storrie, Toronto, Ontario, was engaged to prepare plans and specifications for the project.

APPROVAL

On October 27th, 1961, the municipality signed an agreement with the Ontario Water Resources Commission to finance, construct and operate such a plant.

CONSTRUCTION

Schwenger Construction Company Limited, Burlington, Ontario was awarded the contract. Construction was completed on December 21st, 1962.

TOTAL COST

The total cost of the project was $440, 170. 57.

NORRIS MORLEY
CHIEF OPERATOR

Project Staff

COMMENTS

Mr. Norris Morley joined the Ontario Water Resources Commission in October, 1962, as Chief Operator at the Plant.

Other members of the staff in 1965 were operators B. Pattison and F. Hopkins and labourer L. Lapierre.

The plant is staffed eight hours a day, seven days a week.

GRIT HAULING

Description of Project

INFLUENT WORKS

The waste water enters the plant through a 39" diameter sewer, passing into the influent chamber of the pumping station wet well. The chamber is equipped with a bar screen to remove large objects from the sewage.

From here, the flow is pumped through a comminuting device which screens and shreds the larger particles to a size suitable for handling in the treatment units.

The flow then discharges to the aerated grit chamber where the velocity of flow is reduced sufficiently to allow grit and detritus material, which may damage plant machinery, to settle out. The air introduced in the chamber produces a roll which allows grit to settle out, while keeping the organic material in suspension. Grit is removed manually.

From this point, the flow discharges to the primary tanks.

PRIMARY SEDIMENTATION

The two rectangular tanks are designed to provide an adequate detention period to allow the heavier solids to settle out, and for removal of surface scum and grease.

The tanks are divided into two sections and equipped with longitudinal sludge collectors which serve as skimming mechanisms for removal of surface material and for transferring the settled sludge to hoppers located at the end of the tanks. The sludge hoppers are equipped with cross collector mechanisms which draw the sludge to a central point. The sludge and the surface material is drawn off and pumped to the primary digester.

The settled waste water flows over the effluent weirs into the chlorine contact chamber.

CHLORINATION

The chlorinator is capable of injecting up to 2,000 pounds per day of chlorine into the final effluent to reduce the bacteria count to acceptable limits.

DIGESTION

Sludge digestion in this plant is performed in two stages called primary and secondary digestion.

The sludge from the primary tanks is pumped to the primary digester. In the absence of air, and in a regulated temperature of 90 degrees Fahrenheit, the decomposing or digestion process begins. Constant agitation within the tank ensures overall treatment.

The raw sludge is broken down by anaerobic bacterial action and, when thoroughly digested, is a thick, black, odourless liquid.

The secondary digester receives the digester material from the primary and completes the process. The secondary digester is not agitated, but is allowed to be quiescent. The supernatant is decanted and returned to the treatment process.

Sludge gas (principally methane), formed during the process, is used as a fuel for the heat exchangers and boiler, supplying heat to the digesters and buildings. The standby fuel is oil.

REAR OF MAIN BUILDING, SHOWING CHLORINE LOADING FACILITIES

PROJECT COSTS

NET CAPITAL COST (Final)		$1,467,321.96
DEDUCT - Portion Financed by CMHC (Final)	$996,392.74	
- Payments from Municipalities	30,758.65	1,027,151.39
Long Term Debt to OWRC		$ 440,170.57
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965		$ 31,095.92
Net Operating		$ 34,109.32
Debt Retirement		9,046.00
Reserve		9,900.99
Interest Charged		24,893.10
TOTAL		$ 77,949.41

RESERVE ACCOUNT

Balance at January 1, 1965	$ 22,510.95
Deposited by Municipality	9,900.99
Interest Earned	1,405.13
	$ 33,817.07
Less Expenditures	2,576.22
Balance at December 31, 1965	$ 31,240.85

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	*SUNDRY	WATER
JAN	1179.07	407.94	431.36	271.18			35.28			33.31	
FEB	2217.33	357.06	543.58	121.80	359.10		2.00		4.66	750.01	79.12
MARCH	3289.19	617.86	583.70	333.54	391.33		94.86		82.83	1108.05	77.02
APRIL	2380.48	1215.66	283.60	310.50	364.17		52.53		3.35	69.20	81.47
MAY	5047.14	1532.85	475.55	321.84	390.88	1442.00	41.64	92.12	163.72	511.54	75.00
JUNE	3870.17	1021.90	386.38	72.00	345.30		59.98		903.16	881.81	199.64
JULY	2457.35	1024.70	147.46		340.42		91.18	87.24	199.60	363.80	202.95
AUG	1718.17	1021.90	334.54		429.66	19.58	194.92	86.66	(741.95)	158.56	214.30
SEPT	3104.32	965.10	267.68	54.00	344.45	(40.00)	107.80	284.67	14.68	906.12	199.82
OCT	2595.15	1083.03	334.54		551.33		179.38	94.96	162.40	172.79	16.72
NOV	1963.03	819.06	334.54		416.81		29.96			166.33	196.33
DEC	4287.92	1056.20	213.86	65.34	842.33		125.72	135.48	1137.49	485.76	225.74
TOTAL	34109.32	11123.26	4336.79	1550.20	4775.78	1421.58	1015.25	781.13	1929.94	5607.28	1568.11

* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $2,605.68

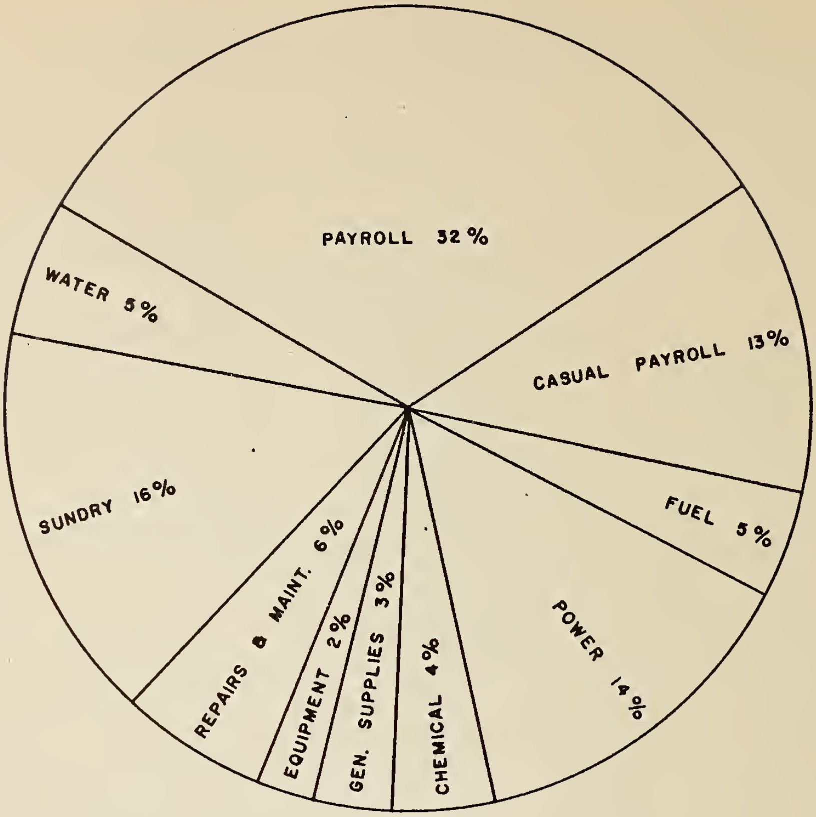
BRACKETS INDICATE CREDIT

YEARLY OPERATING COSTS

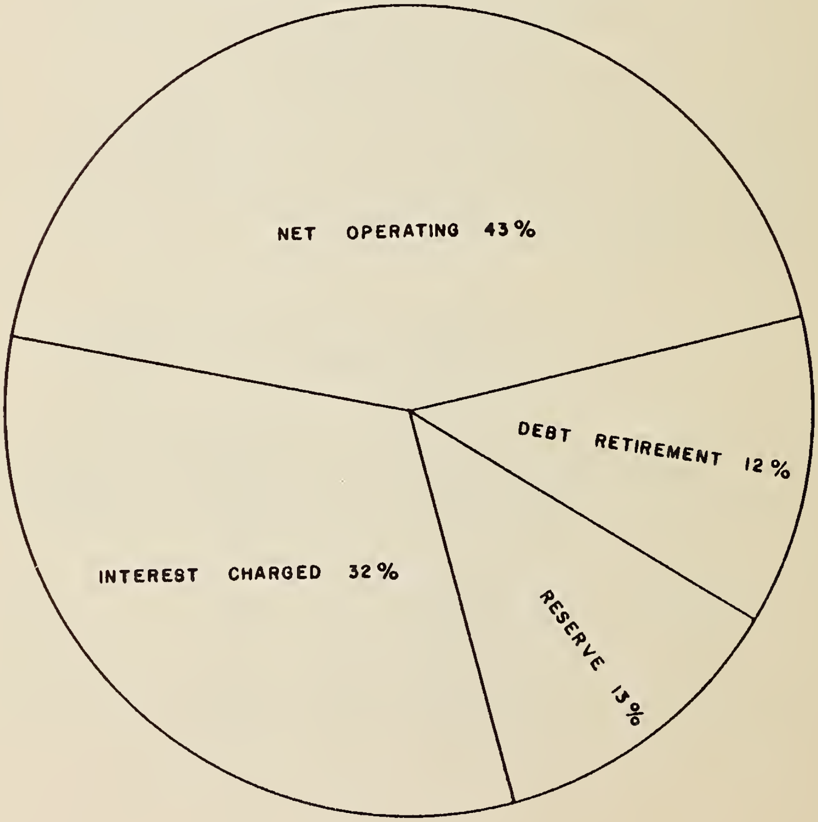
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER LB. OF BOD REMOVED
1963	1164.493	$ 25012.46	* $ 5.46	$ 21.50	1½ CENTS
1964	1147.207	27331.80	5.96	23.82	3 CENTS
1965	1236.31	34109.32	7.41	27.59	6 CENTS

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

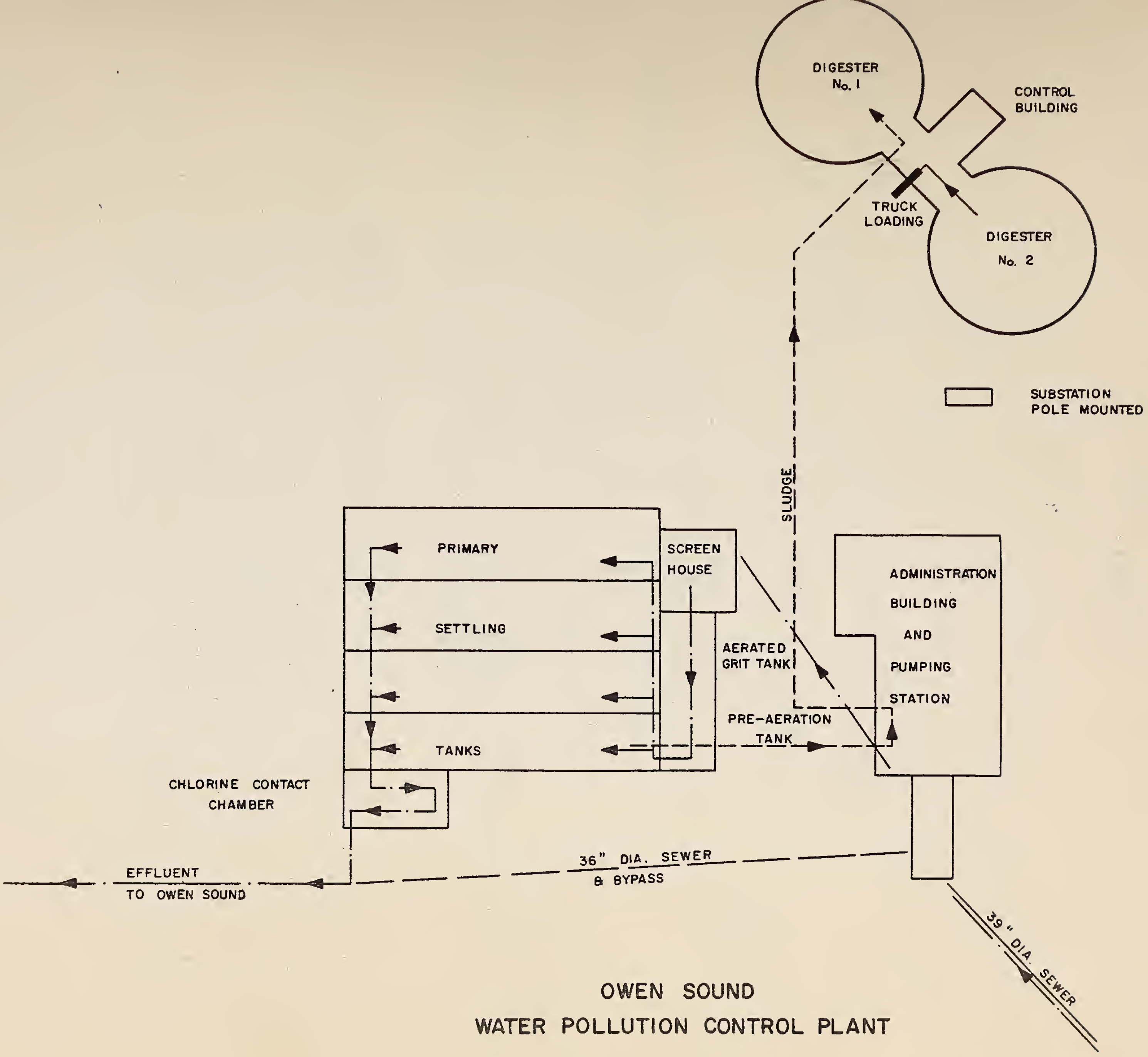
1965 OPERATING COSTS



TOTAL ANNUAL COST



Technical Section



OWEN SOUND

WATER POLLUTION CONTROL PLANT

GENERAL LAYOUT AND FLOW DIAGRAM SCHEMATIC

Design-Data

GENERAL

Type of Plant - Primary treatment.

Design Population - 25,000 persons.

Design Plant Flow - 3.0 million Imperial gallons per day (MGD).

Per Capita Flow - 120 gallons per day.

Five Day BOD -

Raw Sewage - 180 PPM, or 5400 lbs. of BOD per day.

Removal - 40%

Suspended Solids -

Raw Sewage - 200 PPM, or 5000 lbs. of S.S. per day.

Removal - 65%

SEWAGE PUMPING STATION

This station is in the administration building. A 39" diameter influent sewer carries sewage into the wet well through a coarse bar screen. The bar openings are 1 3/4" clear. There is provision for bypassing the pumping direct to the Sound.

The pump capacities are:

One pump - 3150 GPM - TDH of 33 ft. at 1150 rpm electric motors with diesel standby.

Two pumps - 3150 GPM each - TDH of 33 ft. at 1150 rpm electric motors with wound rotors for variable speed drive.

Total pump capacity is 9.0 MGD.

SCREENING

Three parallel channels, one equipped with a Model C, 36" barminutor, the others with bar screens.

AERATED GRIT TANK

Dimensions - 18 ft. 6 in. by 13 ft. by 12 ft.

Volume - 2,890 cubic ft. or 18,000 gallons.

Detention Period - 3.0 MGD - 8.6 minutes.

Detention Period - 9.0 MGD - 2.9 minutes.

PRE-AERATION TANK

Dimensions - 23 ft. 9 in. by 13 ft. by 12.13 ft.

Pre-Aeration Tank (cont'd)

Volume - 3,750 cubic ft. - 23,400 gallons.

Detention Period - 3.0 MGD - 11.2 minutes.

PRIMARY SETTLING TANKS

Two tanks.

Dimensions - 78 ft. by 32 ft. by 12 ft. 6 in.

Volume (total) - 62,400 cubic ft. or 388,000 gallons.

Detention Period @ 3.0 MGD = 3.11 hours.

Surface Settling Rate - 600 gallons per sq. ft. of tank per day.

Weir Overflow Rate - 8,260 gallons per lineal ft. of weir per day.

Chlorine Contact Chamber

Dimensions - 31 ft. by 14 ft. by 8 ft. deep.

Volume - 3,480 cubic ft. or 21,700 gallons.

Retention Time - 11.2 minutes at design flow.

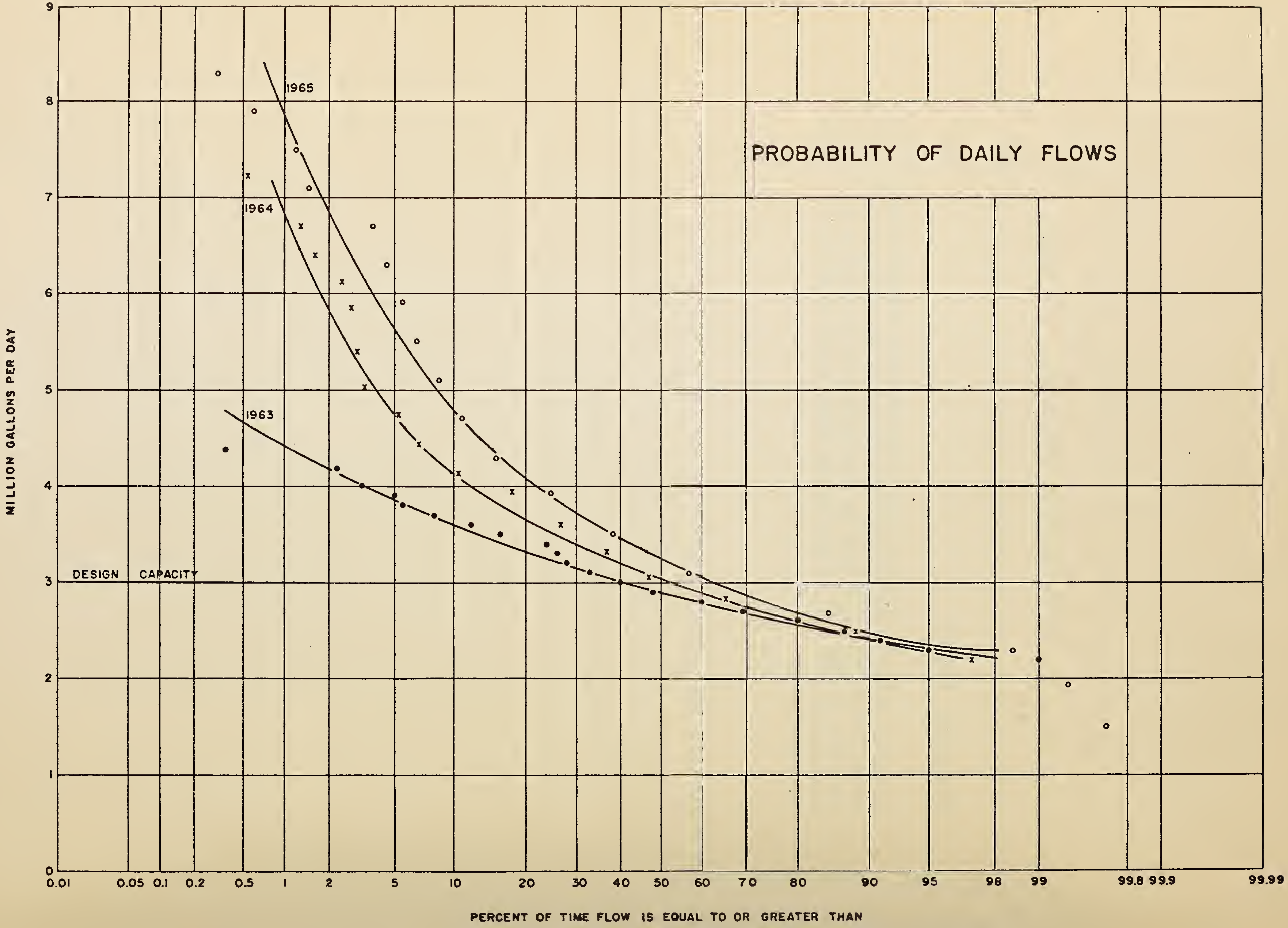
WEST SIDE PUMPING STATION

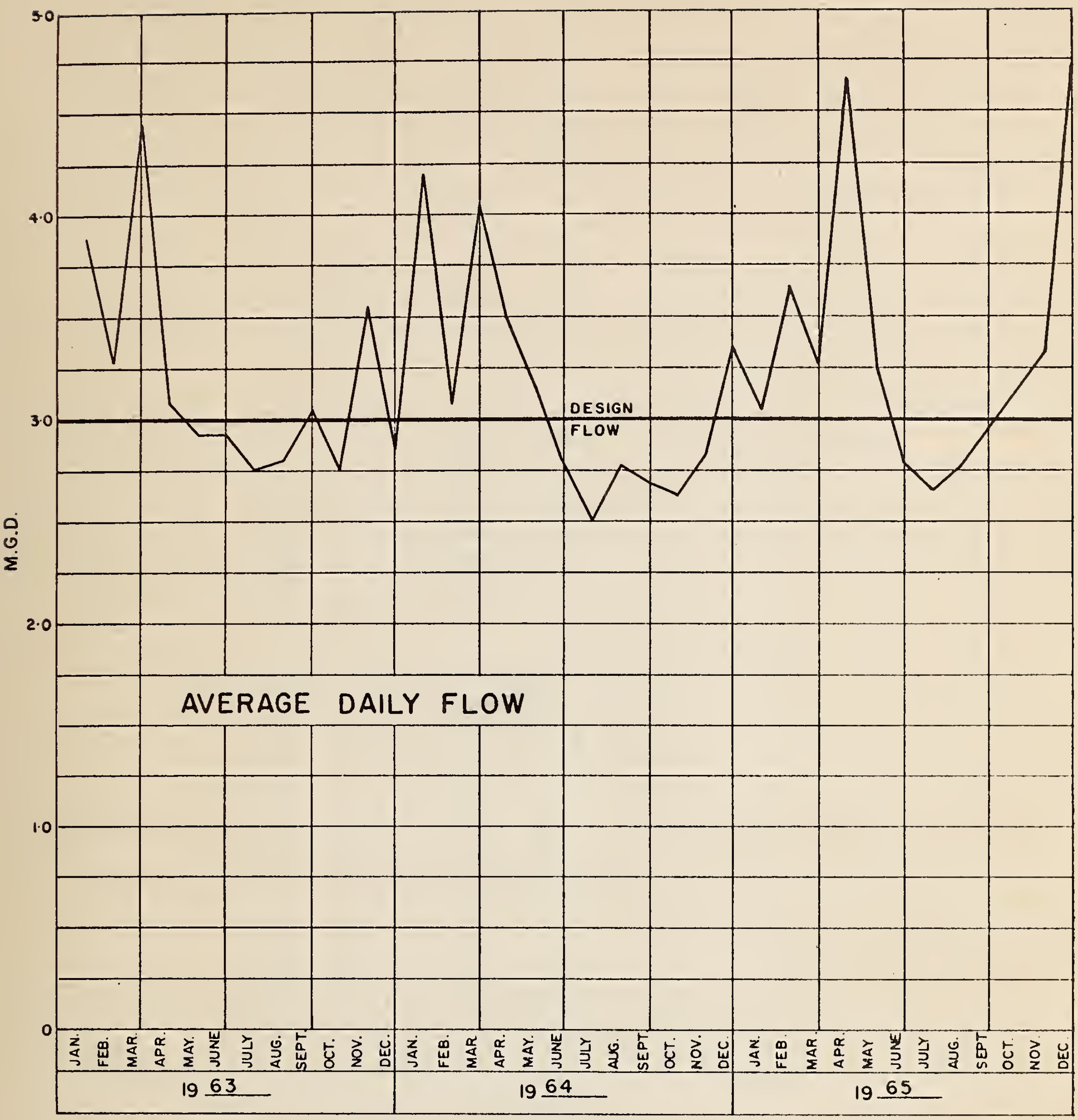
Associated with the plant is a sewage pumping station containing the following equipment:

2 - 1000 GPM electrically driven pumps one of which has a standby diesel drive.

Process Data

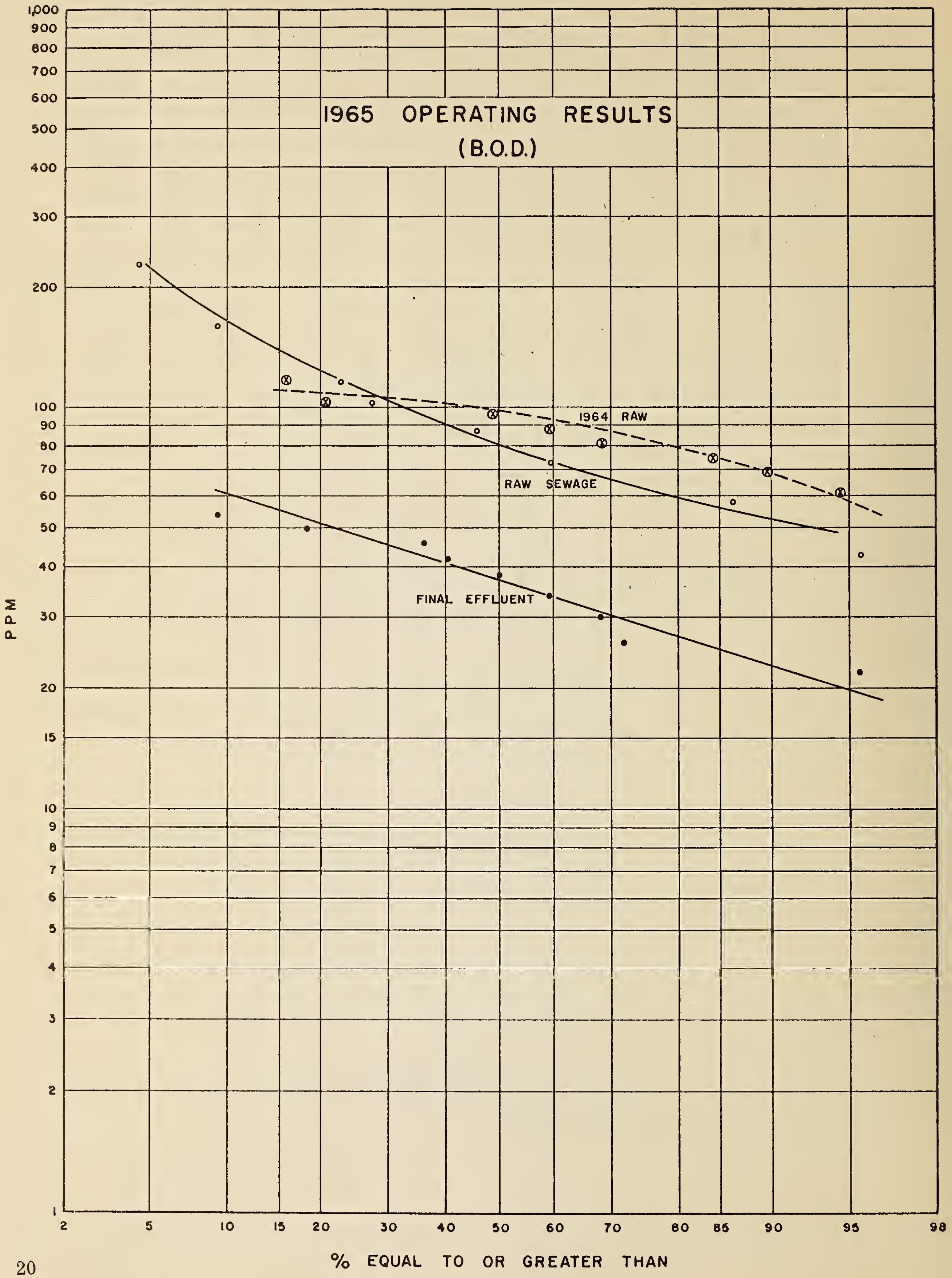
The graph of flow probabilities shows that the plant was hydraulically overloaded 60% of the time in 1965. By comparing the curves of 1963, 1964 and 1965, it can be seen that the peak hydraulic overloading is becoming accentuated each year in spite of the storm sewer program instituted by the municipality.

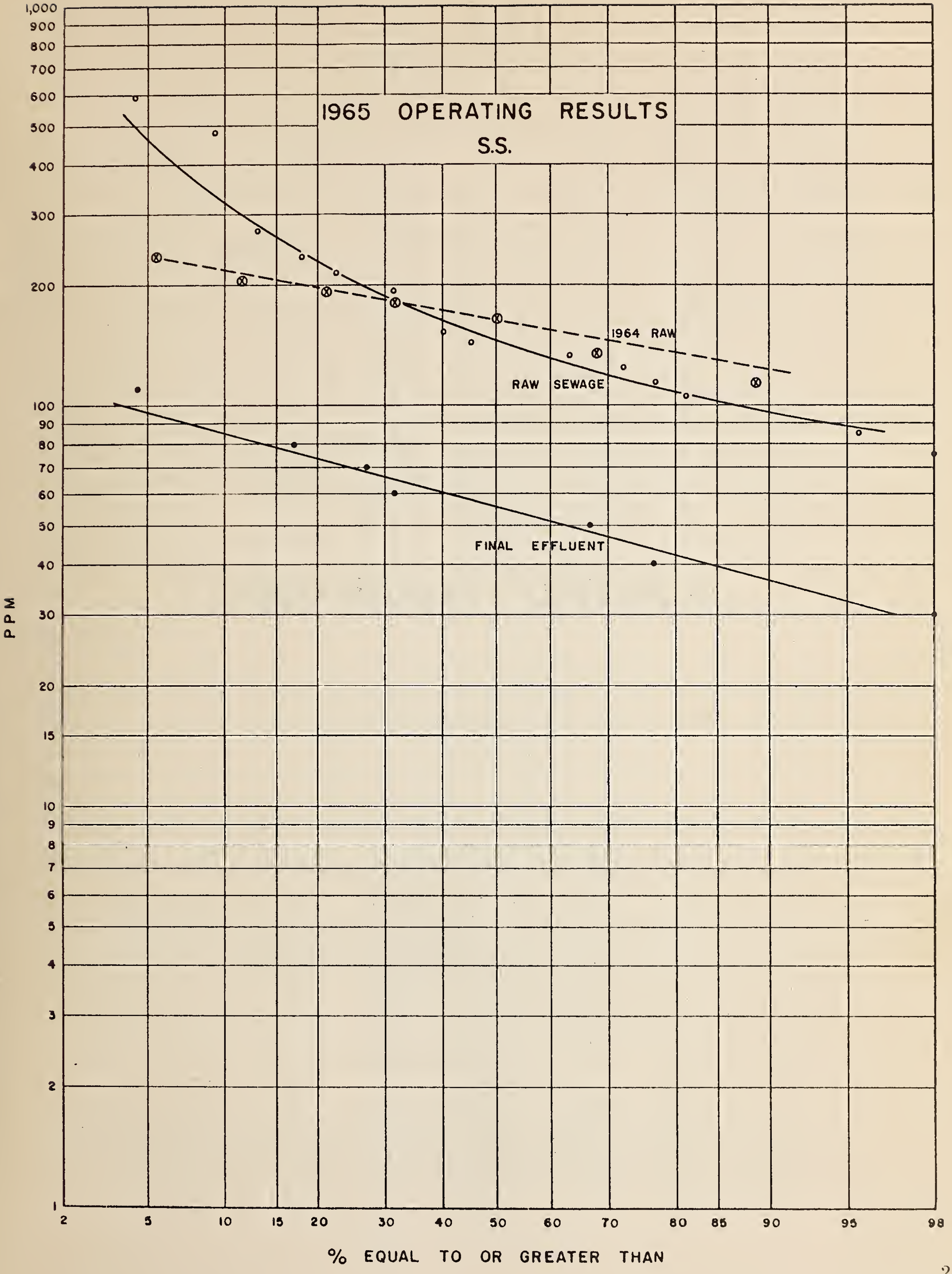

PROBABILITY OF DAILY FLOWS
1965
1964
1963
DESIGN CAPACITY
MILLION GALLONS PER DAY
0
1
2
3
4
5
6
7
8
9
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99

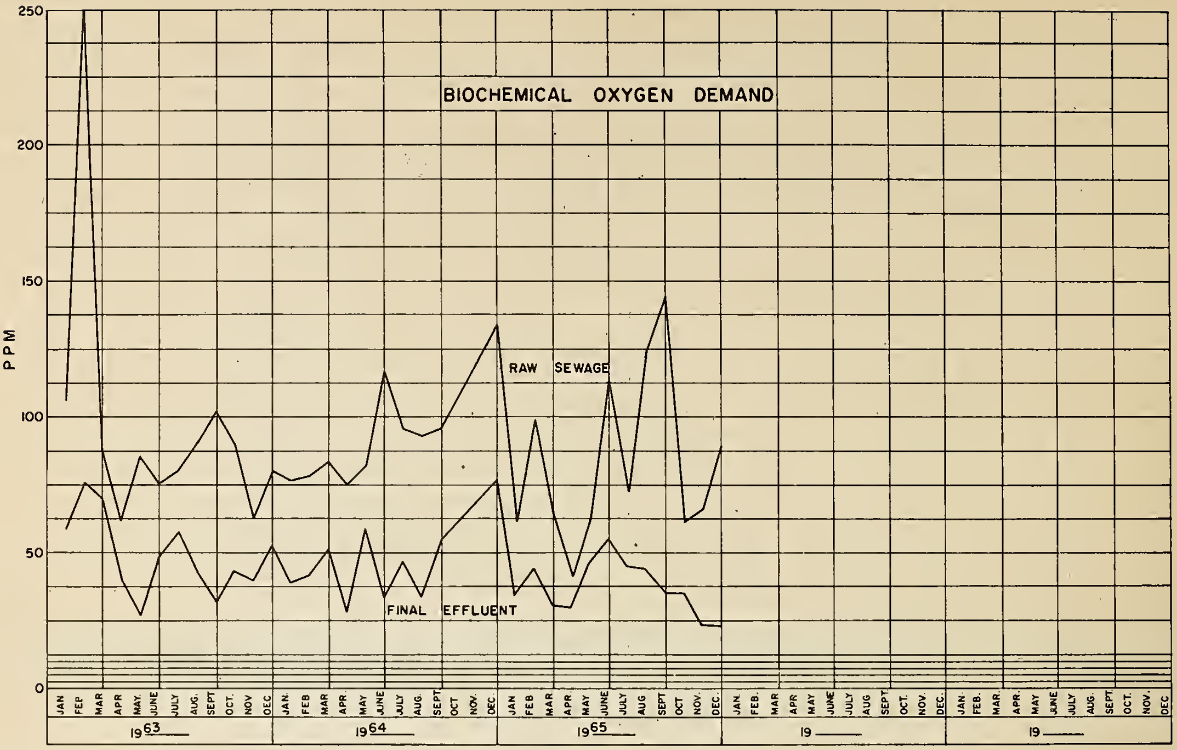


COMMENTS

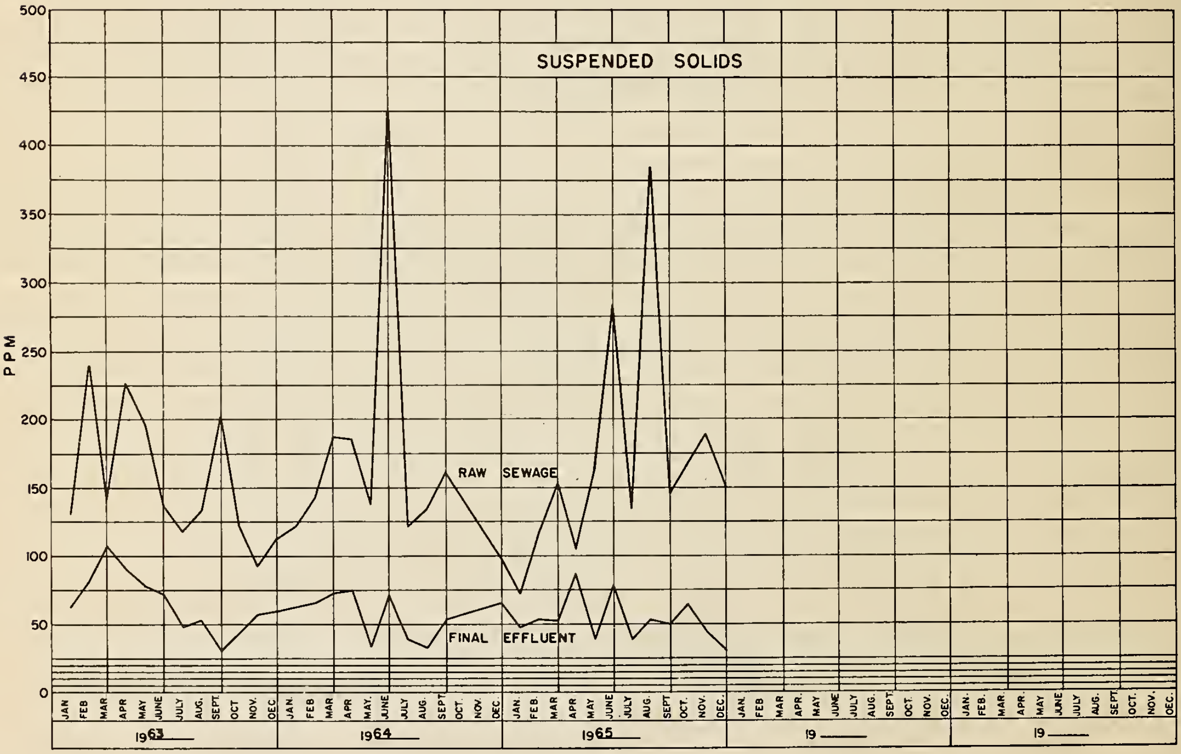
It will be noted that 50 percent of the time the flow is 3.0 million gallons per day and this is the design flow of the plant.


1965 OPERATING RESULTS
(B.O.D.)
1964 RAW
RAW SEWAGE
FINAL EFFLUENT
PPM
1,000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
% EQUAL TO OR GREATER THAN


1965 OPERATING RESULTS
S.S.



MONTHLY VARIATIONS



GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	62	33	46.5	13.8	74	48	35.0	12.3	89.7
FEB.	99	44	55.5	28.0	118	54	54.0	32.6	121.2
MAR.	77	31	60.0	23.4	153	53	65.5	50.9	54.5
APR.	41	30	27.0	7.7	106	88	17.0	12.6	164.6
MAY	63	46	27.0	8.6	162	39	76.0	62.4	103.6
JUNE	115	55	52.0	25.0	278	78	72.0	83.3	78.3
JULY	72	45	37.5	11.1	84	37	56.0	19.3	40.0
AUG.	124	44	64.5	34.3	385	52	86.5	142.6	60.2
SEPT.	144	35	75.5	55.4	146	50	65.5	48.8	87.5
OCT.	61	35	42.5	12.6	169	64	62.0	51.0	80.0
NOV.	66	23	65.0	21.5	189	44	76.5	72.6	84.5
DEC.	58	22	62.0	26.4	152	30	80.0	89.5	148.7
TOTAL	-	-	-	278.2	-	-	-	710.9	1112.8
AVG.	82	37	55.0	23.2	168	53	68.5	59.2	92.7

COMMENTS

Although the strength of raw sewage is weak, the percent removals of BOD and SS of 55 and 68.5 respectively are good for a primary type treatment plant.

DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			GAS PRODUCED 1000'S Cu. Ft.
	1000'S CU. FT.	% SOLIDS	% VOL. MAT.	1000'S CU. FT.	% SOLIDS	% VOL. MAT	
JAN.	39.74	-	-	-	-	-	-
FEB.	35.90	5.85	3.92	1.92	-	-	-
MAR.	39.74	5.60	3.45	8.27	-	-	-
APR.	38.46	5.76	2.29	1.54	-	-	-
MAY	39.74	11.42	4.52	13.46	-	-	-
JUNE	38.46	-	-	12.31	-	-	-
JULY	39.74	-	-	10.00	-	-	*131.74
AUG.	39.74	5.92	2.90	3.44	-	-	333.53
SEPT.	38.46	-	-	3.59	-	-	384.98
OCT.	39.74	6.74	3.36	1.70	-	-	321.25
NOV.	38.46	12.40	5.34	-	-	-	278.32
DEC.	39.74	7.80	2.36	8.21	-	-	225.34
TOTAL	467.92	-	-	64.44	-	-	1675.16
AVG.	38.99	7.69	3.52	6.44	-	-	279.19

* 14 days data,meter restored to service.

COMMENTS

It can be seen that the raw sludge, though high in solids contains less than 50% organic matter. It would appear that silt is entering the digesters. This silt is carried by the infiltration and storm water entering the sewer system.

Insufficient gas is produced to supply the boiler and standby fuel oil must be used to maintain optimum digester temperature.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (P.P.M.)
JANUARY	94.80	-	-
FEBRUARY	101.90	-	-
MARCH	101.75	-	-
APRIL	139.40	-	-
MAY	101.40	* 3075	3.24
JUNE	83.30	3310	3.97
JULY	82.30	3290	4.00
AUGUST	85.68	3315	3.87
SEPTEMBER	** 101.70	3190	3.14
OCTOBER	97.28	3445	3.54
NOVEMBER	100.10	-	-
DECEMBER	146.70	-	-
TOTAL	1236.31	19625	-
AVERAGE	103.03	3271	3.60

** September flows prorated on 11 months of data
* 29 days chlorination

COMMENTS

The plant effluent is chlorinated during fishing season normally from May 1st to November 30th. However, during 1965 a broken chlorine line necessitated the termination of chlorination when the cold weather came.

A residual of 0.5 ppm of chlorine is maintained to reduce the bacteria count in the final effluent.

CONCLUSIONS

The plant is hydraulically overloaded 60% of the time. Raw sewage is weak and infiltration is the probable cause of this overloading.

The population is not high enough to overload the present facilities. However, it may be necessary to have a larger plant capacity in the future if the infiltration cannot be removed from the sanitary sewer system.

RECOMMENDATIONS

Every effort should be made to prevent storm and ground water from reaching the sanitary sewer system.

ONTARIO WATER RESOURCES COMMISSION